

**POLLEN TRANSPORT BY NORTH AMERICAN *TRICHODES* HERBST
(COLEOPTERA: CLERIDAE)**

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Abstract.—Adults of the 11 North American species in the genus *Trichodes* Herbst (Coleoptera: Cleridae) readily acquire pollen while visiting flowers. On museum specimens, pollen grains are concentrated primarily on the vestiture of the pronotum and legs, although pollen is also found on the pubescence at the base of the elytra, the frons, and the ventral surface. Field observations of *Trichodes ornatus* (Say) in Colorado indicate that adults often move between flowers, and suggest that individual populations of these clerids may show some fidelity to particular plant species. *Trichodes* species may be important pollinators of native plant species in North America.

Key Words: *Trichodes*, Cleridae, Coleoptera, pollen, pollination, pollinator

Beetles in the genus *Trichodes* Herbst (Coleoptera: Cleridae) are widely known as flower visitors (Corporaal 1950, Foster 1976, Arnett and Jacques 1981). At flowers, these large, colorful clerids feed on pollen, prey on other insects, mate, and oviposit (Foster 1976; Mawdsley, unpublished observations). Although most *Trichodes* species are densely pubescent, the possibility that these beetles may pollinate flowers has not been previously investigated. Species in the related family Melyridae are known to be important pollinators (Grant and Grant 1965), and may be more efficient and effective than honeybees under favorable circumstances (du Toit 1990).

As a part of my ongoing investigations into the pollination ecology of beetles in the superfamily Cleroidea, I examined pinned adult specimens of North American *Trichodes* species in the collection of the National Museum of Natural History, Smithsonian Institution (NMNH). It quickly became apparent that almost every specimen in this

large collection had pollen grains present in its vestiture. Many of the specimens were densely coated with pollen. Data from these museum specimens, combined with my own field observations on *Trichodes ornatus* (Say) in 1999, suggest that *Trichodes* species may be significant pollinators of native plant species in North America.

EXAMINATION OF MUSEUM SPECIMENS

I examined the entire collection of North American *Trichodes* in NMNH. Almost all of the specimens in this collection (including specimens of all 11 currently-recognized North American species of *Trichodes*) had at least some pollen grains trapped in the dorsal vestiture. Of the 140 specimens that were labeled as having been collected on particular species or genera of plants, all 140 bore pollen. In Table 1, I provide a list of the flowers on which these pollen-bearing clerids were collected.

Trichodes species are densely pubescent. Most specimens examined had pollen

Table 1. Pinned specimens of North American *Trichodes* in NMNH were collected on flowers of the following plant species. All of these specimens bore pollen grains. NMNH specimens of *T. bicinctus* Greene, *T. bimaculatus* LeConte, and *T. nexus* Wolcott also bore pollen grains, but these specimens lacked information about associated plant species. Information in parentheses includes state, locality, and number of beetle specimens. Botanical nomenclature follows the online database of the Missouri Botanical Garden (<http://mobot.mobot.org/W3T/Search/vast.html>).

Trichodes apivorus Germar

- Carduus* sp. (VA: Augusta Co., 1)
Ceanothus sp. (VA: Falls Church, 3; Glencarlyn, 5)
Erigeron sp. (FL: Liberty Co., Rt. 270, 5 miles W Rt. 12, 1)

Trichodes bibalteatus LeConte

- Acacia greggii* Gray (TX: Midland, 3)
Castilleja sulphurea Rydberg (TX: 5 miles E Gregory, 1)
Condalia obtusifolia Hooker (TX: Starr Co., 8)
Coreopsis cardaminefolia (DeCandolle) Nuttall (TX: San Antonio, 1)
Hedeoma sp. (TX: Cotulla, 1)
Hymenocarpus sp. (TX: near Uvalde, 5)
Monarda citriodora Cervantes (TX: Clarendon, 1)
Opuntia sp. (TX: Cotulla, 8)
Prosopis glandulosa Torrey (TX: Scarry Co., Fuller Ranch 1)
Prosopis juliflora (Swartz) DeCandolle (TX: Starr Co., 4)
Prosopis sp. (TX: Guthrie Co., 1; Lubbock Co., Lubbock, Couth Ranch, 1)
Ratibida columnaris (Pursh) D. Don (TX: Cotulla, 3)
Rudbeckia amplexicaulis Vahl (TX: Denton, 1)
Rudbeckia sp. (TX: Dallas, 1)
Verbesina encelioides (Cavanilles) Gray (TX: Cotulla, 2)

Trichodes nutalli Kirby

- Chrysanthemum leucanthemum* L. (NY: Virgil, 1)
Heracleum lanatum Michaux (CO: Boulder, 1)
Solidago sp. (WI: Waupaca, 1)

Trichodes oregonensis Barr

- Achillea millefolium* L. (OR: Jackson Co., 12 miles NE Ashland, 9; 15 miles NE Ashland, 3; 21 miles NE Ashland, 11)

Trichodes oresterus Wolcott

- Condalia obtusifolia* Hooker (TX: Starr Co., 1)
Opuntia sp. (TX: Uvalde, 1)
Prosopis sp. (TX: Presidio, 1)

Trichodes ornatus (Say)

- Achillea millefolium* L. (ID: Spencer, 1)
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Table 1. Continued.

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- Adenostema* sp. (CA: West fork of San Gabriel River, 2)
Aronia sp. (MT: Missoula, 1)
Asclepias sp. (C: Hotchkiss, Rogers Mesa, 1)
Brassica nigra (L.) Koch (OR: Talent, 1)
Ceanothus fendleri Gray (AZ: Flagstaff, Fort Valley, 4)
Ceanothus sp. (OR: Butte Falls, 1)
Eucnide urens (Gray) Parry (AZ: Mohave Co., 2.8 miles E Willow Beach, 1; Kingman Wash, 1; Willow Beach, 2. CA: San Bernardino Co., 1.7 miles W Parker Dam, 4; 11 miles N Earp, 1. NV: Clarke Co., 2.3 miles NW Hoover Dam, 7)
Fallugia sp. (AZ: Grand View, Grand Canyon, 1)
Heracleum lanatum Michaux (ID: Lakeview, 4)
Iris sp. (AZ: Flagstaff, 10)
Mentzelia involucrata Watson (CA: Riverside Co., Desert Hot Springs, 1)
Opuntia sp. (AZ: Sabino Canyon, 10)
Prunus demissa (Nuttall) Walpers (OR: Talent, 1)
Rosa sp. (NV: Baker, 1)
Rubus sp. (CO: Longview, 1)
Sphaeralcea sp. (NV: Mercury, Nevada Test Site, 1)
Taraxacum officinale Weber (WY: Molson, 1)
Trichodes peninsularis horni Wolcott and Chapin
Chrysothamnus sp. (AZ: Maricopa Co., Phoenix, Upper Moon Valley, 1)
Desmanthus sp. (AZ: Nogales, 1)
Gutierrezia sp. (AZ: Douglas, 1)
Verbesina encelioides (Cavanilles) Benth and Hooker (AZ: Douglas, 1)
Trichodes simulator Horn
Chrysothamnus nauseosus (Pallas) Britton (UT: Beaver, 1; Iron Co., 3 miles E of Cedar City, 2)
Chrysothamnus sp. (UT: Ft. Duchesne, 1)
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grains adhering to the dense pronotal hairs and to the shorter hairs on the ventral surface of the tibiae. However, pollen grains also commonly adhered to the vestiture of the frons, the base of the elytra, the venter, and the rest of the legs, and many specimens were uniformly covered with a dense coat of pollen.

FIELD OBSERVATIONS

I collected adults of *Trichodes ornatus* from flowers in open woodlands of *Pinus ponderosa* Douglas in Estes Park, Larimer County, Colorado, during the last week of

June, 1999. My first collecting site was described elsewhere (Mawdsley 1999); another study area of comparable size was identified in similar forest on private land in another portion of the Estes Park valley.

Adults at both sites showed a strong preference for flowers of *Potentilla diversifolia* Lehmann. At the first site, 15 adults of *T. ornatus* were collected on flowers of *P. diversifolia*, while 2 adults were found on *Rubus parviflorus* Nuttall. At the second site, 12 adults of *T. ornatus* were found on *P. diversifolia*, while 1 adult was found on *R. parviflorus*. At both sites, clerids were not found on other seemingly suitable nectar and pollen sources, including flowers of *Achillea lanulosa* Nuttall, *Gaillardia* spp., and *Potentilla fruticosa* L., during the seven days of observation.

Adults of *T. ornatus* at both sites actively moved about the flowers and were often observed flying between flowers. W. F. Barr (*in litt.*) also indicated that *Trichodes* species frequently move about and between flowers while feeding.

DISCUSSION

My examinations of museum specimens indicate that North American *Trichodes* readily acquire pollen grains while visiting flowers. Given the large quantities of pollen observed on some museum specimens, and given that adult *Trichodes* often move between flowers, it seems likely that these clerids are responsible for at least some pollination of the flowers that they visit.

It also appears that individual populations of these beetles may preferentially visit certain flower species, as suggested by my observations on *Trichodes ornatus* in the Estes Park valley. Some of the data in Table 1 provide additional support for this hypothesis. There is, for example, an evident association of northern Virginia populations of *T. apivorus* with *Ceanothus* sp.; an association of *T. bibalteatus* with *Con-*

dalia obtusifolia and *Prosopis juliflora* in Starr Co., Texas, and with *Opuntia* sp. at Cotulla, Texas; an association of *T. oregonensis* with *Achillea millefolium*; an association of *T. ornatus* with *Eucnide urens* in the Mojave Desert and with *Opuntia* sp. in Sabino Canyon, Arizona; and an association of *T. simulator* with *Chrysothamnus nauseosus* in Utah. Fidelity to individual plant species, even if on a local population level, would mean that these clerids are probably more effective pollinators than other, more generalist beetle species.

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LITERATURE CITED

- Arnett, R. H. and R. L. Jacques. 1981. Simon and Schuster's Guide to Insects. Simon and Schuster, New York, 511 pp.
- Corporaal, J. B. 1950. Coleopterorum Catalogus, Pars 23 (Editio Secunda), Cleridae. W. Junk, The Hague, 373 pp.
- du Toit, A. P. 1990. The importance of certain insects as pollinators of sunflower (*Helianthus annuus* L.). South African Journal of Plant and Soil 7(3): 159–162.
- Foster, D. E. 1976. Revision of North American *Trichodes* (Herbst) (Coleoptera: Cleridae). Special Publications of the Museum, Texas Tech University 11: 1–86.
- Grant, V. E. and K. A. Grant. 1965. Flower pollination in the phlox family. Columbia University Press, xi + 180 pp.
- Mawdsley, J. R. 1999. Redescription and notes on the biology of *Amecocerus senilis* (LeConte) (Coleoptera: Melyridae: Dasytinae). Journal of the New York Entomological Society 107(1): 68–72.